

Results of analyses in support of the National Polar Orbiting Earth System Sensor Integrated Program  
Office Hybrid Doppler Lidar Feasibility study

Gary D. Spiers  
Center for Applied Optics  
University of Alabama in Huntsville  
Huntsville  
AL 35899  
USA  
(256) 544 5787  
[gary.spiers@msfc.nasa.gov](mailto:gary.spiers@msfc.nasa.gov)

Abstract

A number of techniques for measuring winds from space using a Doppler lidar have been proposed. These include both coherent and direct detection of aerosol backscatter, direct detection of molecular backscatter and various combinations of all of the above. A wind measurement may be obtained on a single shot or by accumulation of signal over multiple pulses. Adequately addressing these issues also requires that the impact of the platform on both the single shot and pulse accumulation methods be considered. The National Polar Orbiting Earth System Sensor (NPOESS) Integrated Program Office (IPO) has funded a multi-organization study to identify the key differences, if any, of the analyses between these approaches and to identify an approach for long term development.

There were four key requirements addressed in the study. These were ensuring adequate sensitivity to measure velocities in regions of interest, ensuring sufficient velocity accuracy for the measurement to be useful, adequate position knowledge determination to correctly locate a measurement and identification of sampling strategies capable of providing an estimate representative of the wind field sampled.

This paper presents instrument requirements and performance analyses developed as part of the University of Alabama contribution to this study. Initial requirements presented are independent of the measurement technique used and these are then extended and requirements dependent on the measurement technique presented. Finally results of numerical modeling of each of the proposed measurement schemes and their relative performance are presented.

Biography

Gary Spiers received his B.Sc. degree in Physics and his M.Sc. in Lasers and their Applications in 1984 and 1985 respectively from Essex University, England. Between 1985 and 1990 he carried out research in TEA carbon dioxide, excimer and free electron lasers at Heriot-Watt University in Edinburgh, Scotland and participated in ESA studies for a space based Doppler lidar. He joined his present employer in 1990 to work with NASA Marshall Space Flight Center (MSFC) on the Laser Atmospheric Wind Sounder (LAWS) program. Following the LAWS program he was involved in the development at MSFC of a series of space based Doppler lidar concepts collectively known as AEOLUS and most recently acted as coherent lidar systems engineer on the Space Readiness Coherent Lidar Experiment (SPARCLE).